



Great Lakes Environmental Research Laboratory (GLERL)

## The Lake St. Clair Problem

### The Problem

Large masses of aquatic weeds, some containing concentrations of bacteria considered a public health hazard, washed onto the shores of Lake St. Clair. This popular heavily used beach, which lies north of Detroit, was closed for almost 3 weeks, at a great cost to the local economy. Lake front property owners were seriously distressed over the pollution and the unsightly impact on their property. As a consequence of this episode, the Michigan Department of Natural Resources (MDNR), at the request of Governor John Engler, declared research on Lake St. Clair a top priority in 1995.

### Background

In recent years the water clarity of Lake St. Clair has dramatically increased, presumably due to large colonies of zebra mussels, which were first found in the lake in 1988. Each zebra mussel colony consists of thousands of individuals. The zebra mussel indiscriminately filters all living and non-living particles from the water at the rate of 1-liter of lake water per day. In addition, zebra mussels have almost eliminated the native clams by colonizing on their shells and, thus, prohibiting them from feeding.

The Clinton River flows into Lake St. Clair, north of the beach. The river water contains large amounts of nutrients, especially during storm events. It is believed that the river pollutes the lake. It is also likely that nutrients have accumulated in the sediments over many years.

This combination of increased water clarity and nutrients favors, and undoubtedly provides, an ideal environment for growth of aquatic weeds.

### Questions

Why were the aquatic weeds such a major problem in 1994? The zebra mussel colonies have been there for some years and nutrients have been in the sediments and entering the lake via the Clinton River for many years.

Were there unusual physical conditions, i.e., currents and storms that resulted in accumulation of aquatic weeds? If so, how often are these conditions likely to occur?

### Status of NOAA/GLERL Research

**Zebra Mussels and Aquatic Plants:** The zebra mussel population of Lake St. Clair was surveyed in 1990, 1992, and 1994. Populations on the U.S. side of the lake have increased every year, and standing stocks in 1994 were four times higher than in 1992. While changes in water clarity were not measured directly, higher populations of mussels in this region would certainly indicate greater water clarity, greater light penetration, and subsequently, increased growth of aquatic plants.

**Preliminary Analysis of Weather:** Precipitation and wind records were examined for the month the weeds first appeared along the western shores of Lake St. Clair (June 1994). The National Weather Service precipitation record for Detroit Metropolitan Airport for June 1994 showed daily precipitation exceeded 1 inch on June 13 (1.03") and June 24 (1.75"). This is a large amount of precipitation for a 24-hour period, but not atypical of June. A 24-hour precipitation total of 1.0" or greater occurred during June in 4 out of the past 6 years (1988-1993), but only in June 1993 did it exceed 1 inch on two separate days, June 7 (1.11") and June 25 (2.17"). An analysis of wind records from Detroit Metropolitan Airport was made by calculating and then graphing the cumulative hourly wind vectors for the entire month of June 1994. When plotted these wind vectors indicate the path that objects would travel on the water surface. The cumulative vector graph for June 1994 showed the trajectory changed direction frequently, sometimes backtracking and thus forming a relatively 'tight pattern' (not far from the origin). This pattern implies that during the month, winds and the trajectory were not consistently from one direction. Cumulative hourly wind vector diagrams for June of the previous 6 years (1988-1993) revealed that 1993 was similar to 1994. During other years in this period, winds did not change direction frequently, and, therefore, produced longer trajectories. This analysis is rather inconclusive relative to quantifying the appearance, amount, or distribution of weeds that appeared along the western shores of Lake St. Clair in June 1994, because it appears the weather was not atypical of the previous 6 years (particularly June 1993) when weeds did not appear.

## Future

GLERL, the U.S. Navy, MDNR, the Cooperative Institute for Limnology and Ecosystem Research (CILER), and the Environmental Research Institute of Michigan (ERIM) will collaborate in evaluating two approaches for possibly mapping distribution of aquatic weeds. The Navy will fly their multispectral scanner while GLERL, MDNR, CILER, and ERIM obtain "ground-truth observations" by boat. A remotely-operated vehicle, MROVER, will be used by CILER, GLERL, and MDNR to test the usefulness of this vehicle for aquatic weed mapping and its possible application to predicting a subsequent beach problem.

**Computer Modeling:** GLERL has offered to provide assistance to the MDNR and the U.S. Army Corps of Engineers in developing a computer model for predicting the movement of weeds in Lake St. Clair. The model would be based on GLERL's 'Pathfinder' Trajectory Prediction System, a computer model for predicting oil spill trajectories in the Great Lakes.

Weed growth along the shores of Lake St. Clair in June 1994.

